ECOREGION: CONTOURS OF THE CONCEPT

EKOREGIJA: OBRISI KONCEPTA

DARIA VOYLOSHNIKOVA

University of Fribourg, Av. de l'Europe 20, 1700 Fribourg, Switzerland /
Sveučilište u Fribourgu, Fribourg, Švicarska, e-mail: daria.voyloshnikova@unifr.ch

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By now, ecosystemic regionalisation has gone through several decades of conceptual development and localised application. Yet, it remains multiform and 'open to interpretations', both in theory and practice. The article contributes to accommodating ecoregion in social sciences and humanities. To that effect, proceeding from a review of specialised literature, it outlines the essence of ecoregional approach and formulates and discusses the key characteristics of the concept 'ecoregion' (vague definitions, holistic capture, systemic nature, and manageability). Then it presents ecoregion as one of the ideas underlying a wider environmental governance setting in the Adriatic area.
Key words: ecoregion, regionalisation, environment, terminology

Ekološka regionalizacija dosad je prošla kroz nekoliko desetljeća konceptualnog razvoja i lokalizirane primjene. Ipak, i dalje je multiformna i „otvorena za interpretacije" kako u teoriji tako i u praksi. Članak pridonosi razmatranju ekoregije u okviru društvenih i humanističkih znanosti. U tu svrhu, pregledom recentne literature, rad opisuje bit ekoregionalnog pristupa i formulira i raspravlja o ključnim značajkama pojma „ekoregija" (nejasne definicije, holističko shvaćanje, sistemska priroda i upravljivost). Zatim predstavlja ekoregiju kao jednu od ideja na kojima se temelji šire okružje upravljanja okolišem na jadranskom području.
Ključne riječi: ekoregija, regionalizacija, okoliš, terminologija

INTRODUCTION

The area comprising the Adriatic Sea and its terrestrial rim harbours a multitude of natural gems. While it is equally not immune to ecological problems and challenges, in a certain context these can be interpreted as cooperation opportunities. Similarly to other parts of the world, it has experienced intensified processes of environmental cooperation institutionalisation and multiplication of its formats, e.g. in the frames of the Adriatic Ionian Euroregion and the European Union Strategy for the Adriatic and Ionian Region (Sarno, 2015; Salvador, 2019). At the same time, the Adriatic area is a space where an organisational perspective taking root in a distinct approach to regionalisation has found application. Originating from ecology and, later, biogeography, in the 1980s ecoregional mapping principles (e.g. formulated in Omernik, 1987) came into wider usage to underpin the Earth's surface units classification that the World Wide Fund for Nature (WWF) employs in tackling environmental issues.

The present article pursues the goal of bridging the wealth of research on ecoregions produced in natural sciences and related disciplines with the interpretative bent of social sciences and humanities. So as to place ecoregion in the toolkit of the latter, the article summarises the essence of ecoregional approach, suggests and discusses the key characteristics of the concept in question as well as briefly exemplifies its contemporary action plan in the Adriatic area.

In line with the thesis that 'researchers acknowledge the fact that there are no "natural" regions: definitions of a "region" vary according to the particular problem or question under investigation' (Hettne, 2005, 129), scientists have laboured to develop and refine a system of principles for a type of planetary-scale zoning, as sociologists or ethnographers could have done. Regardless of the discipline, the grounding idea of a region is boundary, a convention(ality) confirming the act of subdivision. The ensuing 'ecosystemic region', from the standpoint of a social sciences enquiry, is seen as an instrument of space production and management (environmental and at large), but also as an analytical lens in itself. If taken as an ontologically real unit, it becomes an anchor to the natural scientific viewpoint and can serve to fetch out political and economic premises from environmental cooperation projects (defined, for instance, by the alliance-building logic) against the background of natural givens. If eviscerated critically, the concept of ecoregion swings into collision of ownership rights (be they public or private) and the post-politicisation forehandedly subsumed by the Europeanisation. The latter is meant to denote 'the process of influence deriving from European decisions and impacting member states' (Héritier et al., 2001, 3).

ECOREGIONAL APPROACH

In the domain of ecology, it is currently a globally accepted approach to divide the sea and land into ecoregions. The division naturally ignores the lines traced by political geographers as alien to the discipline. Yet, in doing so it leaves many of the eco-units 'transboundary' in the understanding of the managing authorities and, hence, with a burden of respective environmental management problems. But turning the things around, the solution is found in international governance: 'The need for a regional ecology approach is clear' (Bailey, 2002, 6). Such approach appears to be simply feasible in the times when it is not revolutionary anymore to undertake activities that transcend borders (Best, 2007, 2). There ripens an extremely suggestive idea of spatial primordiality that pervades not only the ecoregional, but also, more generally, the environmentalist thought voiced, for example, by a collaborator at the Foundation for the Eastern Carpathians Biodiversity Conservation in Poland (Niewiadomski, 2004, 168): 'Although political borders may divide an ecoregion, ecological systems develop beyond these virtual boundaries. Therefore, a transboundary approach towards ecological concerns and sustainable development is necessary, both in local and eco-regional scale.' The argument is typical of the scaling-to-the-problem regionalisation, i.e. 'Environmental problems are best assessed in the context of geographic areas

defined by natural features rather than by political or administrative boundaries' (Bailey, 1998, 1. A similar viewpoint can be found in Olson, Dinerstein, 1998). In practice it may look like the case in point brought by Wolmer (2003, 264), who in his description of the logic of expansion of protected areas noticed the following:

It is held that the 'ecological integrity' of certain bioregions, such as watersheds, mountains and river basins, (also variously described as biomes, biospheres, heartlands, eco-zones, eco-regions or eco-spaces) is hindered by environmentally arbitrary barriers to biotic fluxes in the form of administrative and national boundaries.

The applied value of the approach is conservation strategies, optimised for each concrete ecological region, which respond to the related concern with the imperative 'question about the appropriate scales of action' driving new environmental regionalisation (Balsiger, 2011, 44).

Zoning (*raionirovaniye*) has been a fundamental part of the Soviet and Russian physical geographical tradition based on examining genetic interrelationships between geographic components and grounded in the positivist belief in the possibility of distinct zone delineation. This 'landscape science' (Shaw, Oldfield, 2007) has operated with 'continuity' and 'discreteness' as the basic analytical categories and took origin in the works of such scholars as climatologist A. Voeykov (authored *Climates of the Earth* in 1884), geographer V. Dokuchaev (1883) who first described the coincidence of zonalities of soil, climate, vegetation, and animal life, or zoologist and geographer L. Berg (1915) who defined landscape as a harmonic whole. Only much later in the 20th century, the interest for landscape surged in other parts of the world. The studies on world geographical regions (Dokuchaev, 1899; Herbertson, 1905; Udvardy, 1975) and ecosystem ecology (Odum, 1963) fused into works on ecological land classification which link ecology and geography for mapping ecological regions (Blasi et al., 2011, 75).

Ecoregions, rather than being a fruit of a quest for new knowledge, are instrumental, though loosely tuned. They are positioned as a heuristically encountered category and accepted without a rigorous definition under the influence of postmodernism in natural sciences. Hence, they lack the rigour of a 'notion' and could be better conceived of as an 'approach'. The epistemic community, meanwhile, is also aware of the problem touching directly the foundational notion of 'ecosystem': 'in ecology, the concept of an ecosystem is highly multi-dimensional, difficult to define and hard to measure quantitatively' (Barbier, 2009, 618).

CONCEPT COMPONENTS

Characteristically, ecoregions are large, region-scale ecosystems (Bailey, 2002, 3), rarely coinciding with administrative territories. Natural scientists have struggled with elaborating a more precise abstract description: 'Large portions of the Earth's surface over which the ecosystems have characteristics in common are called an ecosystems region, or ecoregion' (Bailey, 1998, p.1). The latter was preceded by more cautious definitions, e.g. 'regions of relative homogeneity with respect to ecological systems involving interrelationships among organisms and their environment', and importantly, 'at various scales' (Omernik, 1995, 49), or 'recognizable regions' that 'exhibit similarities in the mosaic of environmental resources, ecosystems, and effects of humans' (Omernik, 1995, 49). But it was also followed by a more detailed one: 'We define ecoregions as relatively large units of land containing a distinct assemblage of natural communities and species, with boundaries that approximate the original extent of natural communities prior to major land-use change' (Olson et al., 2001, 933). There is an evident disagreement in the debate on the inclusion of the anthropogenic factor, let alone humans as such (Blasi et al., 2011, 76). A relatively woolly explanation of the term is given by one of ecoregions' major champions, WWF: 'large unit of land or water containing a geographically distinct assemblage of species, natural communities, and environmental conditions' (URL 1), which reflects the 'Global 200' definition (Olson, Dinerstein, 1998), and also 'complex pattern determined by climate,

geology and the evolutionary history of the planet' (URL 1). All in all, for non-ecologists these remain 'vaguely defined eco-regions' (Lockyer, Veteto, 2013, 8), nevertheless meekly covering the whole planet in a consistent manner.

Another grand idea behind the ecoregion is holistic capture. A famous Swedish geographer T. Hägerstand (1976, 329) premonished the colleagues: 'How can any sane person dare to confess a hope that he can say something about how to view Nature as a wholeness?' Howbeit, he advocated an integrative scientific effort in human and biological geography and bequeathed what follows: 'I see a central task for Geography to investigate carefully the workings of collateral processes under the perspective of all thing's togetherness and use its insights to teach the lessons of finitude' (Hägerstand, 1976, 334). Under the influence of landscape geography, in landscape ecology a 'holistic and future-oriented conception' of landscape (Naveh, 2000, 7) has been developing since the aftermath of the World War II (in particular, in Czechoslovakia and later in Slovakia) to embed innovative methods of planning and management in the vision of singularity. The latter is similarly incorporated in the study of ecosystems (Omernik, 1995). Ecoregional holism, in turn, offers a paradoxically Cartesian facilitation in response to the positivist itch: it goes vertical in each of the contiguous partitions – as R. G. Bailey (2002, 7) insisted, relying on the ecological land classification technique of J. S. Rowe and J. W. Shread (1981) – to grasp 'a composite whole where the most significant features converge in a distinct and sustained way' (McCloskey, 1989, 131). This provides not only a *sui generis* container for scientific surveying of systemic interconnection and emergent properties, but also a scalable governability matrix, for 'the natural resources of an area do not exist in isolation' (Bailey, 1998, 1) and, consequently, require the anti-Cartesian principle of holism to change the science and practice of resource management (Naveh, 2000) at least in a specific locus. This holistic syntheticism bears a promise for grounding some other concepts, such as sustainability.

Going further, an ecoregional approach helps to overcome the social-natural binary opposition, since under certain circumstance it permits to incorporate the social component into a holistic analysis, additional to the biocoenosis framework. In this vein, 'human activities in the watershed' are judged to be as one of 'the most important factors influencing or determining the composition, structure, pattern, process and function of aquatic ecosystems' (Gao et al., 2011, 4370). Traditionally, human development is discursively set as a thing apart from the realm of Nature. For example, the line of argument established by L. White Jr. (1967) to trace the roots of the ecological crisis posited that it 'was a result of our inculcated Judeo-Christian belief in a transcendent God whose most valued creation …, "Man" was given dominion over the rest, and was thus separated from it.' However, there is a countertendency in depicting humans (Boyce, 2002, 3) or the whole humanity (like in Badiou's philosophy in Johal, 2015) as a part of Nature or of the global ecosystem (Naveh, 2000, 14, using Carson's metaphor of the web of life).

The third important aspect is that ecoregions are systemic: they are defined (with possible imperfections) based on a number of interconnected characteristics, such as vegetation, soil, climate, and specific ecosystem components. The classification can follow one characteristic, like Bailey's genetic approach to the delineation of natural communities of the Earth (Bailey, 1998, 4). But in that case it is less robust, for instance, like the one based on watersheds: a watershed does not necessary comprise a single ecosystem, thus, failing to give a neat 'spatial context' to frame environmental problems (Omernik, 1995, 61). Thus, some put forward the 'principle of comprehensiveness and dominance' of ecosystemic factors (Gao et al., 2011, 4371). Biota and its distribution is yet an important criterion (Olson et al., 2001, 935), because ecoregions are expected to address the threat of biodiversity loss and degradation. This basic element can be interpreted even more narrowly, turning ecoregions into 'regions of similar geographical distribution of animal species' (*The Danube river…*, 2005, 44). Interestingly, it is suggested that subdivision can be 'reflections of the people living in place' (McCloskey, 1989, 131)

and follow 'cultural practices' (like dairy farming) along with 'geographical boundaries provided by the watershed' (like a series of lakes) (Schermer, Kirchengast, 2008, 638).

The work performed on aquatic ecoregions is even more intricate, having as the objective 'to reveal the hierarchical structure and spatial variability of watershed-scale aquatic ecosystems and to provide support for the differentiated management of aquatic ecosystems and the water equality targets management at a watershed scale', an early step being the discovery of 'the spatial distribution and pattern of biological species, community and population' (Gao et al., 2011, 4370). For the studies of environmental cooperation this gives a clue to the integrity between the land and water areas, since in delineating an aquatic ecoregion the principle 'of including land area' is to be adhered to: '[t]hat is to say, the watershed or subwatershed characteristics could control or influence the aquatic life in rivers, streams and other types of water' (Gao et al., 2011, 4370). Whichever set of parameters is used, the outcome desired is that ecoregions 'occur in predictable locations in different parts of the world and can be explained in terms of the processes producing them'(Bailey, 1998, 2).

Conceiving of that patchy, but all-comprising space inevitably evokes boundary as one of the necessary components, embodying the minimum of order. Allegedly, 'the basic unit of most ecological processes is spatial and is synonymous with the land or natural landscape that defines the boundary of the system' (Barbier, 2009, 618). The indicative delineation principle invites to separate zones, keeping most differences in structure and function of ecosystems apart and most similarities within an ecoregion (Gao et al., 2011, 4371). The practical outcome is that 'most ecoregions contain habitats that differ from their assigned biom' (Olson et al., 2001, 935). According to WWF, the systemic 'boundaries of an ecoregion are not fixed and sharp, but rather encompass an area within which important ecological and evolutionary processes most strongly interact' (URL 1). What is noteworthy, at the same time, is that each ecoregion is a complete unit and there is 'no separation [space] and overlap between' the units (Gao et al., 2011, 4371). Indeed, this is *sine qua non* for the scientific ideation, as far as we are reminded by J. Wullweber (2015, 81) that '[l]imits of a system require a radical exclusion – they are not neutral but antagonistic limits'. Thus, on the ground within each partition there actually needs to be a transitional element to balance ecological continuity and differentiation. One of the suitable tools is the concept of ecotone that refers to a zone accumulating tensions coming from the bordering biological communities (Bobra, 2007). It dates back to the 19th century and during its lifespan was developed, for example, by Frederic Clements (who published *Research Methods in Ecology* in 1905) and B. Kuznetsov (who introduced in 1936 the term 'synperate' meaning the limit for a multiple-species range).

However, ecoregion as an intentional object is being put into discrete models of organisation of the geographic space, having a pronounced manageability orientation. On a map, it is transformed into an object, a compact piece of a colourful tool, from a system. Evidently, finding boundaries of an object is far easier than coming to an agreement on the limits of a system; on the other hand, these are also 'natural limits' that have the weakness of being surprisingly discursively mouldable. It might be a reason behind the narrowing of the holistic vision in the applied perspective to favouring vertical interconnectedness while obscuring the links between spatialized ecological systems. Ecoregions appear to have an inbuilt administrative perspective crafted through scientific self-empowering of man, so that he does not feel helpless if faced with the 'Whole of Nature'. This also brings about an interesting insight into the studies of the states' patchwork: the dealing with its ideation and practice are mostly kept separate. There might be a way to think of states' immediate, systemically pervasive, ontological interrelation without having to 'jump scales' (Herod, Wright, 2002, 10) to the global or regional issue level. Additionally, ecoregion delineation in the same geographical area can encompass a single type of division (Omernik, 1987, 119) or multiple hierarchical levels to be 'operated at different spatial scales'

(Gao et al., 2011, 4371). In that way, being a minimally discrete parcel of a global system and eventually containing subdivisions, ecoregion is one of the 'mediating levels between local and planetary life' (McCloskey, 1989, 131).

Fourthly, ecoregions ought to be manageable as well as to support the management system. Environmental policy at a natural region level was envisioned already in the 19th century by John Wesley-Powell, among others (Balsiger, 2011, 44). In our times, as T. Hägerstand (1976, 331) commented, '[l]andscapes or regions with their total content of connected natural and societal phenomena are again coming up on the agenda, if not for other reasons than the practical ones.' This required developing globally scaled, but locally implementable policies, thus '[d]ecision-makers are looking around for experts who are willing to provide broad assessments of alternative courses of action' (Hägerstand, 1976, 331). There was, though, a regrettable impediment: the previously '[e]xisting maps of global biodiversity' were 'ineffective planning tools because they divide[d] the Earth into extremely coarse biodiversity units … typically well beyond the size of landscapes tractable for designing networks of conservation areas' (Olson et al., 2001, 934). Therefore, in tinkering a more convenient instrument a substantial role has been played by the corpus of publications (e.g. Olson, Dinerstein, 1998; Spalding et al., 2007) produced by NGO-affiliated scholars (WWF, the International Union for the Conservation of Nature (IUCN) etc.) who had also used biogeographic maps developed by area experts in the past, including the Digital Map of European Ecological Regions (DMEER) of the European Environment Agency (EEA) (URL 2). In the outcome, the terrestrial world was subdivided on a qualitative map 'into 14 biomes and eight biogeographic realms' with 867 ecoregions within, of which 402 are comprised by 237 units of the 'Global 200' identifying conservation priority areas (Olson et al., 2001, 934). As a geographical project, ecoregion has to be constructed 'backwards'. Stemming from an administrative need, it is being 'greened' back to the discourse of nature. The respective approach may involve large-scale bricolage and certain geopolitical ambition on behalf of the stakeholders (Balsiger, 2011, 45).

A fresh development in moving toward more abstraction in environmental management imaginary has been the landscape archetype for simplified spatial categorisation facilitating the administration of the ecological: the assumption is 'that the same processes shape units in the same category and that these processes are subject to the same drivers and constraints in a particular category' (Cullum et al., 2017, 97). The archetype serves 'as a starting point for the description of a landscape' by providing 'useful ways of articulating the assumptions underlying geo-ecological classifications and maps, guiding the selection of scales and variables' (Cullum et al., 2017, 98).

PRACTICAL APPLICATION AND THE ADRIATIC AREA

Ecoregion is particularly convenient for policy and programme planning and management at the regional and macro-regional scale. For a landscape analogy E. B. Barbier (2009, 613) wrote that 'by adopting ecological landscape, or land area, as the basic unit, modelling the ecosystem as a natural asset is relatively straightforward.' The ready governance model that comes with this feature also contains the idea of bordering in the sense of 'communicating by drawing border' or 'by making a distinction' (Sendhardt, 2013, 31). Such communication is gradually extended to all the stakeholders in the unified environmental management process, and the new 'spatial schema' of ecoregion determines their decisions and behaviour (Moore, 2008, 216). After that, 'scale-matching' of tools to the ecosystem level (Dallimer, Strange, 2015, 132-133) becomes possible.

In the environmentalist practice, WWF entertains conservation planning at ecoregional scale and IUCN follows a similar area approach, in part because 'using this base map to frame discussions' (Olson et al., 2001, 936) helps to advance conservation projects through bureaucracies. The Nature Conservancy worked on an ecoregion framework for conservation planning

in terrestrial, freshwater, and nearshore marine environments (Groves et al., 2000) and, furthermore, the planning approach was tested and improved during the preparation, implementation and individual review of ecoregional and regional conservation plans for the United States and other countries around the globe (Groves et al., 2000). Ultimately, ecosystems region 'has been increasingly accepted and adopted in the ecological management by various governments in many counties' (Gao et al., 2011, 4368). Ecoregions as units of environmental management are used in such countries as Bolivia, Canada, and Peru. Furthermore, they also become a framework for transnational cooperation, like the Carpathian Ecoregion Initiative (CERI). It must be noted that the very ecosystem classifications or single ecoregion descriptions are subject to periodical review and correction.

The Adriatic area here refers to the space of the eponymous sea and territorial stripes on its shores, far from spanning beyond the sea's catchment area. Under the DMEER classification (URL 2), the respective land area puzzles together the diverse and vulnerable ecoregions of Illyrian deciduous forest, Italian sclerophyllous and semi-deciduous forests, Tyrrhenian-Adriatic sclerophyllous and mixed forests, Po basin mixed forests, and Dinaric Mountains mixed forests. Importantly, it is the most 'transnational' Mediterranean-Sea-type marine ecoregion (Spalding et al., 2007) surrounded by the terrestrial ones. Croatia, Italy, Albania, Bosnia and Herzegovina, Slovenia, and Montenegro have a common frame of reference, supportive of the ideas of ecoregionalisation: in particular, these are environmental standards reflected in the European Union's norms applied in the member states or invoked through apposite provisions in the stabilisation and association agreements. The countries share experience of international ecological cooperation (Spoto, 2009; Vallarola, 2013).

Thereby, ecoregion is only one of the whole array of instruments used to underpin the international environmental governance setting, able however to influence the configuration of cooperative ties and efforts. What can be especially practically important for the countries in the process of political and economic transition, is that ecological strategies have to take into account socioeconomic conditions as well. This is due to the assumption that ecoregions may be undergoing rapid change (Groves et al., 2000, 2-2) when affected by a sharp modulation in the anthropogenic factor (Groves et al., 2000, 6-2, the authors distinguish biodiversity loss affecting an ecoregion and human activities as its source). There are several forms in which the concept of ecoregion plays out in the Adriatic area: 1) a global and to a considerable extent unified scientific tool applied at the microstructural level of a region (e.g. to ground maps or research plans); 2) a generic guiding principle transpiring, for example, in the Bern Convention of 1979 or internal European Union's environmental legislation (e.g. the Habitats Directive of 1992); 3) a format for policy development at the national level, for example, by the Italian Ministry for the Environment; 4) consequently, an idea behind interventions in physical space for environmental conservation (the vastest examples are the Emerald Network and the Natura 2000 process); 5) a framing and overarching term for single transversal projects, e.g. the WWF Dinaric Arc Ecoregion (2007-2011) or the Julian Alps Ecoregion (since 2009), both focused on protected areas; 6) a unit of (economic) activity range encircling, such as in the case of the Alpe-Adria bioregion. The discursive overall emphasis is being made on the flexibility and transnational thrust of the concept.

The variety of ways in which ecoregional approach pervades environmental policy realisation in the Adriatic area matches the multifacetedness it demonstrates at the global scale. At the same time, being only a specific tool matured in a particular current of the environmentalist thought, the approach anchors the respective perspective at the programmatic level and can then nimbly underlie multiple policy layers. As in the case of the list above, it can be also used to shift the focus of the analysis to only one of the aspects of cooperation development. Moreover, such experience with different individual initiatives containing ecoregional logic has allowed the actors in the area to accumulate data and knowledge for capacity building and

intra-regional exchanges. Yet, there is a lack of spatial and temporal consistency in the practice of the approach: on the one hand, some areas, unlike some other, have not experienced ecoregion-based management; on the other hand, the flagship role of the ecoregional format has subsided over time, giving way to the larger conceptual unit of the macro-region.

CONCLUSIONS

Even if 'ecoregion' is still vague as a natural scientific notion, it is a valid managerial concept. It determines the scale and eventually the hierarchical level of environmental problem definition and solving. Therefore, adopting a structuring ecoregional outlook deepens analytical incisiveness of research on policy development, community engagement and place-making, spatial permutations, and governance assemblages.

The Adriatic basin has seen continued environmental conservation and cooperation efforts unroll over the past decades. In the meantime, the tool of ecoregion has not only preserved its importance among conservationists, but it has also evolved in certain aspects. Already having a solid scientific base in the area, this straightforward and scalable approach is easily being included into complex territorial management conceptualisation in a larger region, such as the Adriatic Ionian space. Therefore, the persistence of ecoregional vision contributes to path dependency in environmental policy development and implementation, which cannot be addressed but at higher levels of governance and policy-making. The theme of ecoregion then remains interesting for researchers as a source of traceable markers of context and discourse against the backdrop of pan-regional sustainability pursuit activation.

BIBLIOGRAPHY

Bailey, R. G. (1998): *Ecoregions: the ecosystem geography of the oceans and continents*, Springer, New York, pp. 176.

Bailey, R. G. (2002): *Ecoregion-based design for sustainability*, Springer, New York, pp. 222.

Balsiger, J. (2011): New environmental regionalism and sustainable development, *Procedia – Social and Behavioral Sciences*, 14, 44-48, DOI: 10.1016/j.sbspro.2011.03.019

Barbier, E. B. (2009): Ecosystems as natural assets, *Foundations and Trends in Microeconomics*, 4 (8), 611-681.

Berg, L. S. (1915): Predmet i zadachi geografii, *Izvestiia IRGO*, 51 (9), 463-475.

Best, U. (2007): *Transgression as a rule: German-Polish cross-border cooperation, border discourse and EU enlargement,* LIT Verlag, Münster, pp. 296.

Blasi, C., Capotorti, G., Frondoni, R., Guida, D., Mollo, B., Smiraglia, D., Zavattero, L. (2011): Vegetation science and the ecoregional approach: a proposal for the ecological land classification of Italy, *Fitosociologia*, 48 (1), 67-80.

Bobra, T. V. (2007): Poniatiya "granitsa" – "ekoton" – "geoekoton", *Kultura narodov Prichernomorya*, 112, 7-12.

Boyce, J. K. (2002): *The political economy of the environment*, Edward Elgar, Cheltenham, pp. 160.

Cullum, C., Brierley, G., Perry, G. L. W., Witkowski, E. T. F. (2017): Landscape archetypes for ecological classification and mapping: the virtue of vagueness, *Progress in physical geography*, 41 (1), 95-123.

Dallimer, M., Strange, N. (2015): Why socio-political borders and boundaries matter in conservation, *Trends in ecology and evolution*, 30 (3), 132-139.

Dokuchaev, V. V. (1883): *Russkiy chernoziom*, Imperatorskoie Vol'noie ekonomicheskoie obshchestvo, Saint-Petersburg, pp. 326.

Dokuchaev, V. V. (1899): *K ucheniiu o zonakh prirody. Gorizontalnyie i vertikal'nyie pochvennyie zony*, Tipografiyia SPb. Gradonachal'stva, Saint-Petersburg, pp. 28.

Gao, Y., Gao, J., Chen, J., Xu, Y., Zhao, J. (2011): Regionalizing aquatic ecosystems based on the river subbasin taxonomy concept and spatial clustering techniques, *International Journal of Environmental Research and Public Health*, 8 (11), 4367-4385, DOI: 10.3390/ijerph8114367

Groves, C., Valutis, L., Vosick, D., Neely, B., Wheaton, K., Touval, J., Runnels, B. (2000): *Designing a geography of hope: a practitioner's handbook for ecoregional conservation planning*, Nature Conservancy, Arlington, pp. 82.

Hägerstand, T. (1976): Geography and the study of interaction between nature and society, *Geoforum*, 7 (5-6), 329-334, DOI: 10.1016/0016-7185(76)90063-4

Herbertson, A. J. (1905): The major natural regions: an essay in systematic geography, *The Geographical Journal*, 25 (3), 300-310.

Héritier, A., Kerwer, D., Knill, C., Lehmkuhl, D., Teutsch, M., Douillet, A.-C. (2001): *Differential Europe: The European Union impact on national Policymaking*, Rowman and Littlefield, Lanham, pp. 368.

Herod, A., Wright, M. W. (2002): Placing scale: an introduction, in: *Geographies of power: placing scale*, (eds. Herod, A., Wright, M. W.), Blackwell Publishing, Oxford, 1-14.

Hettne, B. (2005): Beyond the 'new' regionalism, *New Political Economy*, 10 (4), 543-571, DOI: 10.1080/13563460500344484

Johal, A. (2015): Badiou, ecology, and the subject of change, *Contours Journal*, 6, 51-57.

Lockyer, J., Veteto, J. R. (2013): Environmental anthropology engaging ecotopia. An introduction, in: *Environmental anthropology engaging ecotopia: bioregionalism, permaculture, and ecovillages*, (eds. Lockyer, J., Veteto, J. R.), Berghahn Books, Oxford, 1-31.

McCloskey, D. (1989): On ecoregional boundaries, *Trumpeter*, 6 (4), 127-131.

Moore, A. (2008): Rethinking scale as a geographical category: from analysis to practice, *Progress in Hu-*

man Geography, 32 (2), 203-225, DOI: 10.1177/0309132507087647

Naveh, Z. (2000): What is holistic landscape? A conceptual introduction, *Landscape and Urban Planning*, 50 (1-3), 7-26, DOI: 10.1016/S0169-2046(00)00077-3

Niewiadomski, Z. (2004): The Carpathians as a region of international co-operation, *Europa Regional*, 12 (4), 168-172.

Odum, E. P. (1963): *Ecology*, Holt, Rinehart and Winston, New York, pp. 152.

Olson, D. M., Dinerstein, E. (1998): The Global 200: a representation approach to conserving the Earth's most biologically valuable ecoregions, *Conservation Biology*, 12 (3), 502-515.

Olson, D. M., Dinerstein, E., Wikramanayake, E. D., Burgess, N. D., Powell, G. V. N., Underwood, E. C., D'Amico, J. A., Itoua, I., Strand, H. E., Morrison, J. C., Loucks, C. J., Allnutt, T. F., Ricketts, T. H., Kura, Y., Lamoreux, J. F., Wettengler, W. W., Hedao, P., Kassem, K. R. (2001): Terrestrial ecoregions of the world: a new map of life on Earth, *BioScience*, 51 (11), 933-938, DOI: 10.1641/0006-3568(2001)051[0933:TEOTWA]2.0.CO;2

Omernik, J. M. (1987): Ecoregions of the conterminous United States, *Annals of the Association of American Geographers*, 77 (1), 118-125, DOI: 10.1111/j.1467-8306.1987.tb00149.x

Rowe, J. S., Shread, J. W. (1981): Ecological land classification: a survey approach, *Environmental management*, 5 (5), 451-464, DOI: 10.1007/BF01866822

Salvador, R. (2019): A strategy for the Adriatic and Ionian Maritime Region: the making of a Macro-region across the EU border, in: *The overarching issues of the European space: a strategic (re)positioning of environmental and socio-cultural problems?*, (eds. Pina, H., Martins, M. F.), Faculdade de Letras da Universidade do Porto, Porto, 327-334.

Sarno, E. (2015): La cooperazione transfrontaliera per le aree protette nell'Eurodistretto Adriatico, *Geotema*, 49, 174-177.

Schermer, M., Kirchengast, C. (2008): Eco-regions: how to link organic farming with territorial development, in: *Cultivating the future based on science, V.2. Livestock, socio-economy and cross disciplinary research in organic agriculture. Proceedings of the second scientific conference of the International Society of Organic Agriculture Research*, (eds. Neuhoff, D., Halberg, N., Alföldi, T., Lockeretz, W., Thommen, A., Rasmussen, I.A., Hermansen, J., Vaarst, M., Lueck, L., Caporali, F., Hogh Jensen, H., Migliorini, P., Willer, H.), ISOFAR, Bonn, 636-639.

Sendhardt, B. (2013): Border types and bordering processes. A theoretical approach to the EU/Polish-Ukrainian border as a multidimensional phenomenon, in: *Borders and border regions in Europe*, (eds. Lechevalier, A., Wielgohs, J.), Transcript, Bielefield, 21-43.

Shaw, D. J. B., Oldfield, J. (2007): Landscape science: a Russian geographical tradition, *Annals of the Association of American Geographers*, 97 (1), 111-126, DOI: 10.1111/j.1467-8306.2007.00526.x

Spalding, M. D., Fox, H. E., Allen, G. R., Davidson, N., Ferdaña, Z. H., Finlayson, M., Halpern, B. S., Jorge, M. A., Lombana, A., Lourie, S. A., Martin, K. D., McManus, E., Molnar, J., Recchia, C. A., Robertson, J. (2007): Marine ecoregions of the world: a bioregionalization of coastal and shelf areas, *BioScience*, 57 (7), 573-583, DOI: 10.1641/B570707

Spoto, M. (2009): AdriaPAN: un nuovo progetto per le aree protette marine e costiere dell'Adriatico, in: *Aree protette costiere e marine. Pianificazione e forme di fi nanziamento. Atti dei seminari 2008 AIDAP in "Benvenuto Parco" Area Marina Protetta Torre del Cerrano*, (ed. Vallarola, F.), EDIT Press, Castellalto, 183-200.

The Danube river basin district. Part A – basin-wide overview, ICPDR, Vienna, 2005.

Udvardy, M. A. (1975): *A classification of the biogeographical provinces of the world. IUCN Occasional Paper 18*, IUCN, Morges, pp. 49.

URL 1, *What is an ecoregion*, WWF, http://wwf.panda.org, 6. 8. 2016.

URL 2, *DMEER: Digital Map of European Ecological Regions*, EEA, https://www.eea.europa.eu/data-and-maps/figures/dmeer-digital-map-of-european-ecological-regions, 12. 11. 2009.

Vallarola, F. (2013): *Adriatico Protetto*, Lulu edizioni, Pineto, pp. 130.

White, L. JR. (1967): The historical roots of our ecologic crisis, *Science: New Series*, 155 (3767), 1203-1207.

Wolmer, W. (2003): Transboundary conservation: the politics of ecological integrity in the Great Limpopo transfrontier park, *Journal of Southern African Studies*, 29 (1), 261-278, DOI: 10.1080/0305707032000060449

Wullweber, J. (2015): Global politics and empty signifiers. The political construction of high technology, *Critical Policy Studies*, 9 (1), 78-96, DOI: 10.1080/19460171.2014.918899